REMARKS

Reconsideration of this application is respectfully requested.

Claim 1 has been amended to more clearly define the invention of a photopolymerizable element. There has been no change in substance and no new matter is involved since the basis for the amendment is found in the specification on page 9 at lines 8 through 12, and in the Examples.

Claim 31 has been amended to more clearly define the invention. There has been no change in substance and no new matter is involved since the basis for the amendment is found in the specification on page 11 at lines 11 through 16, page 18 at lines 16 through 19, and in the Examples.

Claim 33 has been amended to more clearly define the invention of a relief printing plate. There has been no change in substance and no new matter is involved since the basis for the amendments is found in the specification on page 4 at lines 13 through 17; page 5 at lines 24 and 25; page 11 at lines 2 through 4; and in the Examples.

New Claim 40 has been added. There has been no change in substance and no new matter is involved since the basis for the new Claim 40 is found in the specification on page 12 at lines 30 through 33, page 6 at line 2, page 4 at lines 6 through 13, and page 11 at lines 11 through 16.

The rejection of Claims 1, 3 through 19 and 31 through 33 as being unpatentable over Cushner et al. (U.S. 5,798,202) in view of Marshall et al. (U.S. 5,441,850), Grasshoff et al. (U.S. 5,445,917) or Gaudiana et al. (U.S. 6,004,719), under 35 U.S.C. 103(a), is respectfully traversed. Claims 1 and 33 define a photopolymerizable element for use as a flexographic printing plate comprising a support and a photopolymerizable elastomeric layer on the support. The photopolymerizable layer comprises a binder, at least one monomer, a photoinitiator, an onium salt and a leuco dye. Claim 1 defines a photopolymerizable element wherein the onium salt is selected from the group consisting of phosphonium salts, selenonium salts, triarylselenonium salts, iodonium salts, diaryliodonium salts, sulfonium salts, triarylsulphonium salts, dialkylphenacylsulphonium salts, triarylsulphoxonium salts, aryloxydiarylsulphoxonium salts, dialkylphenacylsulphoxonium salts, and combinations thereof. In use, the photopolyermizable layer is imagewise exposed to actinic radiation forming polymerized and unpolymerized portions in the layer, and also backflash exposed through the support to actinic radiation to form a floor. The imagewise exposed layer is then treated to remove the unpolymerized portions and form a relief surface having raised areas

that contrast in color with the floor. The Examiner has indicated that given the teachings of the secondary references disclosing imaging mediums comprising leuco dyes, it would be obvious to one of ordinary skill in the art to prepare the material of Cushner et al. choosing to employ the conventional color formers of the secondary references with reasonable expectation of achieving a material having uniform thickness.

Cushner et al. disclose a process for making a flexographic printing plate by laser engraving a printing element having a reinforced elastomeric layer on a support. The elastomeric layer may be reinforced photochemically by incorporating photohardenable materials into the elastomeric layer and exposing the layer to actinic radiation. Photohardenable materials include photocrosslinkable or photopolymerizable systems or combinations thereof. Photopolymerization occurs when relatively low molecular weight monomers or oligomers undergo photoinitiated cationic polymerization or free-radical polymerization to form substantially insoluble polymers. Photohardenable materials include a photoinitiator or photoinitiator system (hereinafter photoinitiator system). Upon exposure to actinic radiation, the photoinitiator system forms a species that will initiate either free-radical or cationic crosslinking or polymerization reactions. Onium salts such as iodonium and sulfonium salts are mentioned as suitable photoinitiator systems for cationic crosslinking or polymerization reactions for polymerization of ethylene oxide or epoxy derivatives.

Cushner et al. do not teach or suggest a need for color contrast in an image. Cushner et al. disclose only that the onium salt is present as a possible cationic photoinitiator system, and do not suggest in any way that an onium salt may be used to create a color contrast in an image. There would be no particular need for the element of Cushner et al. to exhibit a contrasting color image because the elastomeric layer is reinforced and laser engraved to form the relief image. The elastomeric layer is photochemically reinforced by *overall* exposure to actinic radiation to effect photohardening in depth prior to laser engraving (col. 13 at lines 1 through 6). Overall exposure of the elastomeric layer would preclude forming a contrasting color image for the element.

Furthermore, the mere possible presence of an onium salt for cationic photoinitiated crosslinking or polymerization reactions in a photopolymerizable elastomeric layer as disclosed by Cushner et al. does not teach or suggest the use of the onium salt to photoinduce a change in color in the layer. Cushner et al. disclose that the photoinitiator system upon exposure to actinic radiation initiates either free radical *or* cationic crosslinking or photopolymerization reactions (Applicant's emphasis). There is no teaching or suggestion by

Cushner et al. that the elastomeric layer contains both a free-radical initiator and a cationic initiator.

All of the secondary references, i.e., Marshall et al., Grasshoff et al. and Gaudiana et al., disclose an imaging medium that provides a change in color as an image, but the imaging medium is not a photopolymerizable printing element that forms a relief surface for flexographic printing. The secondary references disclose an imaging medium wherein the effect of the color change creates the image desired. None of these references teaches or suggests an imaging element that requires both a photopolymerization (or crosslinking) reaction in addition to the color change reaction. There is no reason why one of ordinary skill in the art based on the disclosure of Cushner et al. would look to the imaging medium of these secondary references but for the hindsight offered by the present invention.

The imaging media disclosed in these secondary references all require at least the presence of a superacid precursor (such as an onium salt), a secondary acid generator, and an acid-sensitive material or an imaging dye (such as a leuco dye) to effect a change in the color of the dye and form the image. Through a series of reactions the secondary acid generator forms an acid that then reacts with the imaging dye to produce the color change image. Exposure of the superacid precursor forms a superacid which, upon heating, catalyzes the secondary acid generator into an acid so that the quantity of (secondary) acid is larger than the quantity of super acid produced from the acid precursor, so called chemical amplification. It should be noted that, unlike the present invention, the acid formed by exposure of the superacid precursor (e.g., onium salt) does not react directly with the imaging dye (e.g. leuco dye). And in most cases, the superacid precursor and the secondary acid generator are in a separate layer or phase from a layer containing the imaging dye, until they are brought together by heat to effect the color change.

Of the three secondary references, only Grasshoff et al. disclose that the process of chemical amplification of the superacid by the secondary acid generator may be used for purposes other than changing color such as triggering an acid-catalyzed chemical reaction, e.g., polymerization reaction. But such disclosure neither shows nor suggests a photopolymerizable element having both a free-radical initiated photopolymerization (and/or crosslinking) reaction *and* a photoinduced color change reaction.

The photopolymerizable element of the present invention includes a photopolymerizable system comprising binder, at least one monomer, and a photoinitiator for providing a relief structure suitable for flexographic printing; and a photoinduced color

change system comprising a selected group of onium salts and a leuco dye for providing color contrast to the image and preferably in the relief structure. The photopolymerizable element of the present invention is not obvious from the disclosure of Cushner et al. in view of Marshall et al., Grasshoff et al. or Gaudiana et al. because the references are absent some teaching, suggestion or incentive to support such a combination. There must be some objective teaching, suggestion or motivation in the applied prior art taken as a whole and/or knowledge generally available to one of ordinary skill in this art that would lead that person to the presently claimed invention as a whole. It would not be obvious to one skilled in the art to combine the disclosure by Cushner et al. of a laser engravable elastomeric layer that may include a cationic photoinitiator for polymerization or crosslinking, with imaging media that includes a superacid precursor as catalyst to effect a color change. There must be some suggestion or motivation to combine the teachings of the references. Cushner et al. do not suggest or teach in any way a need for a contrasting color image in the photopolymerizable element. The secondary references do not suggest or teach in any way effecting imagewise color change in a photopolymerizable element. The suggestion or motivation to produce Applicant's claimed invention is not found in these references.

For the same reasons stated above, the combination of Cushner et al. with the three secondary references does not render obvious a printing plate made from a photopolymerizable element wherein the photopolymerized layer has a relief surface with raised areas and a floor that contrasts in color with the raised areas, as recited in Claim 33. Cushner et al. do not teach or suggest a need for color contrast in an image, nor between raised areas of a relief surface and the floor in the photopolymerized layer of a flexographic relief printing plate. The secondary references do not teach or suggest an imaging element that includes a relief surface having a color differential between the raised areas and the floor.

The rejection of Claims 1, 3 through 19 and 31 through 33 as being unpatentable over Araki et al. (JP 59-211036) in view of Applicant's admission, under 35 U.S.C. 103(a), is respectfully traversed. The Examiner had indicated that it would have been obvious to one of ordinary skill in the art to prepare the material of Araki et al. choosing to employ an elastomeric binder as taught to be conventional by the Applicant, with reasonable expectation of achieving a material having superior work efficiency.

Araki et al. disclose a photopolymerizable image-forming composition containing a binder of a polymeric material, photopolymerizable monomer or oligomer, photopolymerization initiator, reducing dye, and a VIb group onium salt-type photoactivator

having an optical absorption wavelength range different from the photopolymerization initiator. Although Araki et al. suggest use of their photopolymerizable image-forming composition for relief printing plates, no examples are provided showing use in a relief printing plate, and the disclosure of Araki et al. is primarily directed to its application as a photoresist. Araki et al. disclose that the composition may contain 0.01 to 10 parts by weight of the reducing dye agent and 0.001 to 2 parts by weight of the VIb group onium salt photoactivator. In Example 1, a photopolymerizable composition containing a binder (polymethyl methacrylate), monomer, photoinitiators, a leuco dye, and an onium salt is coated to form a 2 mil (50 micron) layer on a support, which is then laminated to a copper side of an epoxy resin plate. The laminated plate was exposed to 90 millijoules of ultraviolet radiation from a high pressure mercury lamp for 20 seconds, resulting in unexposed parts of the layer being colorless, and exposed parts of the layer being clearly colored purple.

Applicant has amended Claim 1 to further define the photopolymerizable element by reciting that the onium salt is present in greater reactive amount than the leuco dye. To prepare a flexographic printing plate from the photopolymerizable element, the element is exposed to actinic radiation for each of the main imagewise exposure, backflash exposure, and post-exposure. *The onium salt is present in greater reactive amount than the leuco dye* so that the leuco dye is completely reacted or substantially completely reacted with the onium salt during the main imagewise exposure of the element. After the main exposure, no or substantially no leuco dye is available to react with the excess onium salt. Thus, any further change in color contrast should not occur when the element is post-exposed. (The backflash exposure is typically much shorter than the main exposure, and thus sufficient exposure energy is not reached to induce the color change.) As shown in the Example starting on page 25 of the present specification, a photopolymerizable element having the leuco dye in greater amount than the onium salt, created color contrast after main exposure, but lost its color contrast after final post exposure/finishing. In order for the photopolymerizable element to retain color contrast in the resulting printing element, the onium salt must be in greater reactive amount than the leuco dye.

Araki et al. alone or in combination with the present background disclosure do not teach or suggest that the onium salt is present in greater reactive amount than the leuco dye, as now recited in Claim 1. Araki et al. disclose a proportion of each of the components in the composition, but the ranges disclosed appear to have the reducing agent (dye) in greater amounts than the onium salt photoactivator (see page 5, last paragraph). This is substantiated

in Example 1 where the composition contains the dye reducing agent at 1.0 g and the onium salt at 0.1 g, that is the amount of the dye is 10 times the amount of the onium salt. Araki et al. does not address how to retain the color contrast in a photopolymerizable element that undergoes multiple exposures. Therefore, the photopolymerizable element as presently recited in Claim 1, is not obvious from the disclosure of Araki et al..

For the reasons stated above, the combination of Araki et al. with Applicant's admission does not render obvious a printing plate made from a photopolymerizable element wherein the photopolymerized layer has a relief surface with raised areas and a floor that contrasts in color with the raised areas, as recited in Claim 33. Araki et al. do not teach or suggest color contrast between raised areas of a relief surface and the floor in the photopolymerized layer of a flexographic relief printing plate.

Claims 3 through 19, 31, 32 and 40 are dependent from Claim 1. Therefore, Claims 3 through 19, 31, 32 and 40 incorporate the patentable novelty of Claim 1, and the allowance of such claims over the cited references appears to be in order for at least the reasons given with respect to Claim 1.

Reconsideration and allowance of this application are respectfully requested.

Respectfully submitted,

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Dated: January 27, 2006